1.22 HOBOS – To be(e) or not to be(e)

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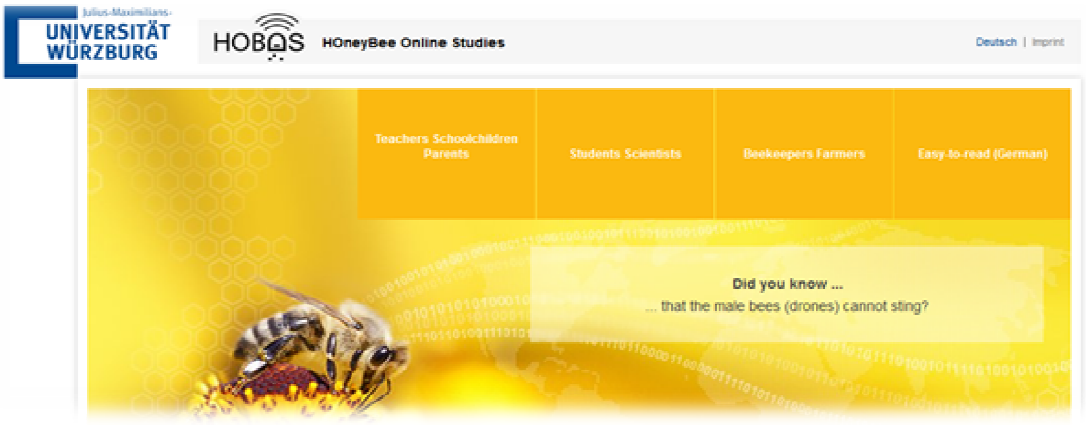

Short Description:

Secondary school students (13-14 years of age) learn at workstations about the achievement and the endangering of honeybees, focusing on communication and orientation of honeybees, the ecological and economic importance of honeybees, the colony collapse disorder and about what humans can learn from honeybees (Bee-onics). The structure of this learn-unit is based on the inquiry approach and includes hands-on-activities as well as interactive e-learning elements.

Aims:

The overall aim of this case study is to promote appreciation of students for honeybees as necessary organism for environment. Furthermore, the students should learn different aspects:

- The students gain an overview of the ecological and economic importance of the honeybee
- The students get an insight into the structure of an insect society, exemplified by the honeybee.
- The students develop the ability to extract relevant information from research data and charts by using the internet portal HOBOS.
- The students develop an understanding for the necessity of the preservation and protection of the honeybee and its habitat.

Fostered Skills:

The most important skill which is supported by the project is the **critical thinking**. Students are required to rethink the human impact on environment. The hands-on circle is carried out as a **collaborative group work**. Students learn how to distribute roles and how to interact with each other. Furthermore they work on their **skills of discussions**, **compromising and providing feedback**.

Connection to the curriculum:

Biology (Social insects, honeybees, ecology, etc.), Mathematics (geometric figures), Science & Technology (bionics)

Implementation of the Demonstrator

What is HOBOS?
HOBOS (HOneyBee Online Studies) makes possible nearly every form of investigation: A short visit to the honeybee colony with technical equipment like webcams, sensors, endoscopes and thermovision allows access to the bee colony around the clock. These data, together with data on the weather and vegetation (like measurement of the water demand of the plants) not only are presented live, but can be used offline as well. HOBOS also allows for ambitious long-term projects, which support independent work and inquiry-based learning.

Learning Cycle:
The "To Bee or not to bee" -learning cycle consists of four interdisciplinary topics. Each topic includes two working stations with analogue and digital content. To solve the e-learning-exercises the students use different tools and data from internet platform HOBOS. The topics do not build upon each other, they could be considered as independent learning modules:

[1] Bionics (mathematic considerations of the honeycombs, usage in technology and architecture, etc.)
[2] Economic and ecological importance of the honeybees (Calculation and projection of the achievement of the pollination, impacts of a pollination lack on human and nature, further achievements of the honeybees)
[3] Life in the dark bee hive (communication and regulation)
[4] Bee mortality (CCD, reasons for that phenomena, action options for society, economy and policy)

The characteristic steps (learning activities) can be found in each learning module. It is shown exemplarily for the module "Life in the dark bee hive" – Regulation:

1st learning activity: Orientation and asking Questions
Students get an introduction into the internet platform HOBOS and how to work with. Afterward they read a short text about a beehive at Christmas. The question will be: "Does a bee hive freeze in winter"?

2nd learning activity: Hypothesis Generation and Design
Students generate hypotheses what temperature the bee hive in winter has.

3rd learning activity: Planning and Investigation
The students enter the HOBOS platform (http://www.hobos.de/en) leaded by some questions and tasks. They search for appropriate data to verify their generated hypotheses.

4th learning activity: Analysis and interpretation
Having finished the work with the bee hive data at the HOBOS platform, the students find out the explanation for that phenomenon by reading a text about the thermoregulation in a bee colony.

*The 5th learning activity "Conclusion and evaluation" takes place after the completion of the whole learning cycle. T*he students reflect then their learning process in a group reflection, how they could handle the eLearning tasks and how they procedure in the scientific way.

Domain:	**Big Idea of Science:**	**Age group:**	**Time needed:**
Biology, Mathematics	8, 10	12-15	3-4 hours. These course hours can be conducted in block or split up to subdivisions.
Languages available:	**Equipment needed**	**Involved actors**	**Used eTool and link:**
German Internet platform: German, English (and soon in Spanish)	1 computer/ tablet/laptop for 2 persons	teachers, researchers	HOBOS http://www.hobos.de/en

Quality Characteristics of the Demonstrator

Characteristic I
how Demonstrator follows an **inquiry based approach**

Throughout the whole programme students are asked to work independently with their workbook. The tasks are posed in a way that requires forming hypotheses on one's own. Additionally students carry out experiments during the hands-on circle. During the eLearning unit they analyse given data and formulate their own conclusions. In the end they reflect on their learning process.

Characteristic II
how Demonstrator integrates **eLearning element**

The learning cycle contains eLearning elements as well as other hands-on experiments and tasks. Having both methods it is possible to integrate eLearning in an exciting learning context which allows the students to get an insight into a topic comprehensively (Inside and Outside of a bee hive) which supports a deeper and more concrete knowledge about the subject matter.

Characteristic III

how Demonstrator follows a **Big Idea of Science**

Ideas of science:

Organisms require a supply of energy and materials for which they are often dependent on or in competition with other organisms: A bee hive is a superorganism and each single organism is dependent on the other single organisms.

The diversity of organisms, living and extinct, is the result of evolution: Especially the honeybees are one example for a current evolution step. The bee hives underlie the changes in environment and globalism and are threatened in the context of the Colony Collapse Disorder.

Characteristic IV:
how Demonstrator is connected to a **real world problem**

The CCD (Colony Collapse Disorder) is Colony collapse disorder (CCD) is a phenomenon in which numerous honeybee colonies abruptly disappear. The most important thing the students learn in this context is the impact on their daily life, if the bee would not exist anymore. One aim of “To Bee or not to Bee” is to show the students some action options for society and themselves.

Experiences with the Demonstrator?

Not yet.